STATE UNIVERSITY OF NEW YORK
COLLEGE OF TECHNOLOGY
CANTON, NEW YORK

MASTER SYLLABUS

CONS 304 – Reinforced Concrete

CIP Code: 15.0201

Created by: Robert R Blickwedehl
Updated by: Adrienne C. Rygel

School: Canino School of Engineering Technology
Department: Civil and Construction Technology
Implementation Semester/Year: Fall 2024

A. TITLE: Reinforced Concrete

B. COURSE NUMBER: CONS 304

C. CREDIT HOURS (Hours of Lecture, Laboratory, Recitation, Tutorial, Activity):

# Credit Hours per Week	**3**
# Lecture Hours per Week	**2**
# Lab Hours per Week	**2**
Other per Week	

D. WRITING INTENSIVE COURSE:

Yes	
No	x

E. GER CATEGORY:

Does course satisfy a GER category(ies)? If so, please select all that apply.

[1-2] Communication	
[3] Diversity: Equity, Inclusion & Social Justice	
[4] Mathematics & Quantitative Reasoning	
[5] Natural Science & Scientific Reasoning	
[6] Humanities	
[7] Social Sciences	
[8] Arts	
[9] US History & Civic Engagement	
[10] World History & Global Awareness	
[11] World Languages	

F. SEMESTER(S) OFFERED:

Fall	
Spring	x
Fall and Spring	

G. COURSE DESCRIPTION:

In this course, the fundamentals of cast-in-place reinforced concrete design by the strength design method are introduced. Students design slabs, beams, girders, columns and footings in accordance with current version of American Concrete Institute Code 318. Computations are done by manual methods and spreadsheets. Students are introduced to design software. A design of elements of a small multistory commercial building is incorporated into the class.

H. PRE-REQUISITES:

CONS 336 (Structural Analysis), CIVL 339 (Structural Analysis Lab), and CONS 280 (Civil Engineering Materials); or permission of the instructor.

CO-REQUISITES: CIVL 339 (Structural Analysis Lab)

I. STUDENT LEARNING OUTCOMES:

Course Student Learning Outcome [SLO]	Program Student Learning Outcome [PSLO]	GER	ISLO & Subsets
a. Analyze and design a reinforced concrete slab	SO 2, SO1		ISLO 2 (PS) and ISLO 5
b. Analyze and design reinforced concrete beam (rectangular and tee-beam)	SO 2, SO1		ISLO 2 (PS) and ISLO 5
c. Analyze and design a reinforced concrete girder	SO 2, SO1		ISLO 2 (PS) and ISLO 5
d. Detail shear reinforcement for beams	SO 2, SO1		ISLO 5
e. Detail splices and anchorages for reinforcement	SO 2, SO1		ISLO 5

KEY	Institutional Student Learning Outcomes [ISLO 1 – 5]
ISLO #	ISLO & Subsets
1	**Communication Skills** Oral [O], Written [W]
2	**Critical Thinking** *Critical Analysis [CA], Inquiry & Analysis [IA] , Problem Solving [PS]*
3	**Foundational Skills** *Information Management [IM], Quantitative Lit, /Reasoning [QTR]*
4	**Social Responsibility** *Ethical Reasoning [ER], Global Learning [GL],* *Intercultural Knowledge [IK], Teamwork [T]*
5	**Industry, Professional, Discipline Specific Knowledge and Skills**

J. APPLIED LEARNING COMPONENT:

Yes	x
No	

If yes, select [X] one or more of the following categories:

Classroom / Lab	x	Community Service	
Internship		Civic Engagement	
Clinical Practicum		Creative Works/Senior Project	
Practicum		Research	
Service Learning		Entrepreneurship [program, class, project]	

K. TEXTS:

Darwin, D., Dolan, C., Nilson, A. (2016) Design of Concrete Structures, 15th Edition. New York, NY: McGraw Hill Education. ISBN: 978-0-07-339794-8.

L. REFERENCES:

Current Building Code Requirements for Structural Concrete and Commentary. American Concrete Institute.

M. EQUIPMENT: None

N. GRADING METHOD: A-F

O. SUGGESTED MEASUREMENT CRITERIA/METHODS:

Exams
Quizzes
Design Project(s)
Homework

P. DETAILED COURSE OUTLINE:

I. Introduction
- A. Concrete and Reinforced Concrete as a material
- B. Advantages and Disadvantages of Structural Concrete
- C. ACI Code
- D. Reinforcing Steel
- E. Concrete Mix Materials
- F. Dead and Live Loads

II. Fundamental Principles of Bending
- A. Behavior of a concrete beam in flexure
- B. Analysis of unreinforced beam by the flexure formula
- C. The internal couple method of analysis
- D. The strength design method for composite material

III. Analysis and Design of Rectangular Reinforced Concrete Beams
- A. Balanced, Over-reinforced, and Under-reinforced Beams
- B. Criteria for a tension controlled section
- C. Detailing requirements
- D. Load Factors
- E. Strength reduction factors and the maximum practical moment
- F. Rectangular Beam Analysis for Moment (Tension Reinforcement only)
- G. Rectangular Beam Design for Moment (Tension Reinforcement only)

IV. Slabs
- A. Slab nomenclature
- B. ACI Criteria for one way slabs
- C. Slab analysis
- D. Slab design
- E. Design of slabs on grade

V. Tee Beams
- A. Tee Beam Analysis for Moment (Tension Reinforcement only)
- B. Tee Beam Design for Moment (Tension Reinforcement only)
- C. Design of compression steel

VI. Girder Design
- A. Introduction
- B. Calculation of shears and bending moments
- C. Girder design

VII. Design of Shear Reinforcement in Beams
- A. Introduction
- B. Analysis of beams with no shear reinforcement
- C. ACI Code requirements for shear steel
- D. Shear Reinforcement Design Procedure
- E. Design for torsion

VIII. Development Length - Introduction
- A. Development Length - Tension Bars
- B. Development Length - Standard Hooks in Tension
- C. Development of Web Reinforcement
- D. Splices
- E. Cutoff of tension bars
- F. Design of additional shear reinforcing in zones where tension bars are terminated

IX. Column Design
- A. Introduction
- B. Strength of Reinforced Concrete Columns - Small Eccentricity
- C. Code Requirements Concerning Column Details
- D. Analysis of Short Columns - Small Eccentricity
- E. Design of Short Columns - Small Eccentricity
- F. Eccentrically loaded columns

X. Footings
- A. Introduction
- B. Design of Square Reinforced Concrete Footings

Q. LABORATORY OUTLINE:

1. Rectangular Beam flexural design , Tension Control
2. Rectangular Beam flexural design , Compression Control
3. T Beam flexural design , Tension Control
4. T Beam flexural design , Compression Control
5. Beam flexural design , Tension Control
6. Slab design
7. Beam Shear design
8. Bonding Design